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# A review of Vietnamese *Schistoloma* Kobelt, 1902 with a list of all known species of the genus (Caenogastropoda: Cyclophoroidea: Pupinidae)

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**Abstract.** The Vietnamese members of the genus *Schistoloma* are reviewed, and a checklist of all *Schistoloma* species is provided. Five species are recognised from Vietnam, including *Schistoloma maydelineae* new species, from Khánh Hoà Province. It is can be distinguished from all of its congeners by the strongly ribbed, conical shell and a white, conspicuous suture. *Pinteria croesus* Varga, 1972 is a synonym of *Schistoloma inermis* (Bavay & Dautzenberg, 1909). The latter species is recorded from China, Yunnan Province, for the first time. The Philippine *Schistoloma* subspecies of Bartsch are all considered synonyms of the nominotypical forms.

**Key words.** taxonomy, systematics, conchology, shell

## INTRODUCTION

The pupinid genus *Schistoloma* Kobelt, 1902 is characterised by a relatively large (up to 30 mm), usually conical, smooth shell, with a rounded aperture usually lacking any channels, and a multispiral, thin, proteinaceous operculum. This genus is widely distributed in East Asia, ranging from the Himalaya to the Philippines (Kobelt, 1902; Bartsch, 1916; Egorov, 2013). So far seven species have been reported from Vietnam. Four of them, namely *Schistoloma cochinchinense* (Rochebrune, 1882), *S. croesus* (Varga, 1972), *S. inermis* (Bavay & Dautzenberg, 1909), and *S. messageri* (Bavay & Dautzenberg, 1909), were originally described from Vietnam, whereas three others were described from other countries and were subsequently reported from Vietnam. *Schistoloma sumatranum* (Dohrn, 1881) was reported from the Tam Dao National Park by Khắc et al. (2012), which is the type locality for *Pinteria croesus* Varga, 1972. Therefore, we presume that this record refers to that species instead of *S. sumatranum*. *Schistoloma funiculalum* (Benson, 1838) was reported from Ninh Hoa District, Khanh Hoa Province (Thach, 2016), but the photo (Thach, 2016; fig. 121) clearly shows a *S. cochinchinense* specimen. *Schistoloma sectilabrum* (Gould, 1844) was also reported from the same locality (Thach, 2016), far from its distribution in Malaysia, Myanmar, and Thailand.

In this paper, we describe *Schistoloma maydelineae* new species from southern Vietnam's Khánh Hoà Province, review the Vietnamese members of the genus, and present a checklist of all *Schistoloma* species.

## MATERIAL AND METHODS

The counting of the shell whorls (to the closest 0.25 whorl) follows Kerney & Cameron (1979: 13).

**Abbreviations.** D: shell diameter; H: shell height; HA: Collection András Hunyadi (Budapest, Hungary); HNHM: Hungarian Natural History Museum (Budapest, Hungary); MEM: Collection M. E. bin Marzuki (Matu, Sarawak, Malaysia); MNHN: Muséum National d'Histoire Naturelle (Paris, France); SA: Collection Simon Aiken (York, United Kingdom); SMF: Senckenberg Forschungsinstitut und Naturmuseum (Frankfurt am Main, Germany);YSC: Collection Y. Chen (Medan, Sumatera Utara, Indonesia).

## TAXONOMY AND SYSTEMATICS

### Family Pupinidae L. Pfeiffer, 1853

### Genus *Schistoloma* Kobelt, 1902

*Schistoloma* Kobelt, 1902: 298 (nom. nov. pro *Coptocheilus* Gould, 1862).
*Pinteria* Varga, 1972: 134 (type species: *Pinteria croesus* Varga, 1972, by original designation)
*Schistoloma* (*Hololoma*) Bartsch, 1916: 195 (type species: *Megalomastoma quadrasi* Hidalgo, 1889, by monotypy).

**Type species.** *Cyclostoma altum* Sowerby, 1842 by original designation.

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**Diagnosis.** Shell high conical to elongate oviform, sculpture mostly smooth, rarely ribbed, periumbilical keel present or absent, aperture rounded without any tubes or slits, operculum corneous, multispiral, the individual coils overlap with each other and fuse only at their centre.

**Remarks.** It is obvious that the Vietnamese members of *Schistoloma* can be divided into two groups. Namely, one with a periumbilical keel (*S. cochinchinense*, *S. messageri*) and one without (*S. inermis*, *S. maydelineae* new species). The presence or absence of this character has been used as a distinguishing mark on the genus level in other pupinid genera (Páll-Gergely et al., 2015). In the Philippine members of this genus however, there is a continuous variability between those two types. Therefore, it is not suggested to subdivide the genus based on this character at the moment. The subgenus *Hololoma* Bartsch, 1916 is said to have a narrow slit in the upper edge of the aperture, but this character is not clear in the illustrations of Bartsch (1916). Even if a slight slit is present in some species, it might not be sensible to split the genus based on this character with our current understanding, especially because this is only the edge of the distribution of the genus, and it is unlikely that the nominal genus has an extremely wide distribution. Given the large geographical area and the simple shell, it is possible that the genus *Schistoloma* is a group of species with plesiomorphic characters, and therefore, not monophyletic. Keeled species might be phylogenetically closer to *Tortulosa* Gray, 1847, than to non-keeled *Schistoloma* species.

## Review of the Vietnamese members of the genus *Schistoloma*

### *Schistoloma cochinchinense* (Rochebrune, 1882)

(Fig. 1A)

*Catalus cochinchinensis* Rochebrune, 1882: 62 (type locality: "Sanglu, Cochinchine").
*Schistoloma cochinchinense* — Kobelt, 1902: 279.
*Schistoloma funiculata* — Thach, 2016: 39, fig. 121.
*Schistoloma cochinchinense* — Egorov, 2013: 14, fig. 22c.

**Types examined.** Not examined.

**Additional material examined.** Đồng Nai Province, 20 km east of Long Khánh, Núi Chứa Chan, 100 m southwest of Chùa Bửu Quang, 470 m a.s.l., 10.950260°N, 107.371347°E, leg. A. Hunyadi, 02.02.2019, HA/23, HNHM 103478 (Fig. 1A); Đồng Nai Province, 20 km east of Long Khánh, Núi Chứa Chan, 80 m east Chùa Bửu Quang, 10.950635°N 107.373400°E, leg. A. Hunyadi, 02.02.2019, HA/6; Đồng Nai Province, ca. 1.5 km from Vườn Quốc Gia Cát Tiên towards Bàu Sấu, along the path, 11.454449°N 107.366197°E, leg. A. Hunyadi, 03.02.2019, HA/16; Đồng Nai Province, Vườn Quốc Gia Cát Tiên, 7.1 km from ferryboat harbour towards Bàu Sấu on the main road, 160 m a.s.l., 11.447651°N 107.383646°E, leg. A. Hunyadi, 03.02.2019, HA/2.

**Diagnosis.** A large *Schistoloma* species with smooth, elongate-ovoid shell having a strong periumbilical keel. Differs from *Schistoloma messageri* by the larger, more ovoid shell, and less prominent keel.

**Distribution.** *Schistoloma cochinchinense* is known from Southern Vietnam (Dong Nai and Binh Phuoc Provinces).

**Remarks.** The photos of Thach (2016) clearly show *Schistoloma cochinchinense* instead of *Schistoloma funiculalum*.

### *Schistoloma inermis* (Bavay & Dautzenberg, 1909)

(Fig. 1C–F)

*Coptochilus inermis* Bavay & Dautzenberg, 1909: 287, plate 11, figs. 8–9 (type locality: "Tan-Doc, aux confins du Delta et de le région montagneuse").
*Pinteria croesus* Varga, 1972: 134, figs. 6–11. **new synonym**.
*Schistoloma croesus* — Egorov, 2013: 14, fig. 22g.

**Types examined.** Tan-Doc, leg. Messager, MNHN-IM-2000-28067 (syntype of *Coptochilus inermis*, Fig. 1C); Vietnam, Tam Davao (? [label hardly readable]), SMF 192262/1 (labelled as syntype of *Coptochilus inermis*, Fig. 1D); Vietnam, Annam, Tam Dao, subtropischer Wald, 900 m, leg. T. Pócs, 08.10.1963, HNHM 11895 (holotype of *Pinteria croesus*, Fig. 1E), HNHM 011896 (4 paratypes).

**Additional material examined.** China, Yunnan, Honghe Hanizu Yizu Zizhizhou, Pingbian Miaozu Zizhixian, Pingbian Daweishan Yuanshi Senlin Gongyuan, 2085 m a.s.l. 22°54.835′N 103°41.958′E, leg. A. Hunyadi, 27.03.2011, coll. HA/2 (Fig. 1F).

**Diagnosis.** A middle-sized *Schistoloma* species with a smooth, conical-ovoid shell, without any signs of a periumbilical keel.

**Distribution.** *Schistoloma inermis* is known from Northern Vietnam (Vinh Puc Province), and the Chinese Yunnan Province. The type locality (Tan-Doc) could not be located on the map.

**Remarks.** There are no notable differences between *Pinteria croesus* and *S. inermis*. Therefore, it is considered as junior synonym of that species.

### *Schistoloma maydelineae* Páll-Gergely, P.K. Nguyen & Y. Chen new species

(Fig. 2)

**Type material.** Holotype (H: 21.2 mm, D: 9 mm) (HNHM 103476), Vietnam, Khánh Hoà Province, Khánh sơn, 11°58.7′N, 109°3.6′E, coll. Phi Khanh Nguyen, 16 April 2018; HA/1 paratype, YSC/6 paratypes, MEM/2 paratypes, SA/5 paratypes, same data as holotype.

**Diagnosis.** A middle-sized *Schistoloma* species with strongly ribbed conical shell, slight indication of a periumbilical keel, and a white, conspicuous suture.


Fig. 1. Shells of *Schistoloma* Kobelt, 1902. A, *Schistoloma cochinchinense* (Rochebrune, 1882), HNHM 103478 from Đồng Nai Province, Vietnam; B, *Schistoloma messageri* (Bavay & Dautzenberg, 1909), labelled as syntype SMF 192263; C–F, *Schistoloma inermis* (Bavay & Dautzenberg, 1909). C, syntype MNHN-IM-2000-28067; D, syntype SMF 192262; E, holotype of *Pinteria croesus* Varga, 1972, HNHM 11895; F, specimen in coll. HA from Yunnan, China. Photographs by: M.C. Gutierrez (C, downloaded from the website of the MNHN) and B. Páll-Gergely (A, B, D–F). Scale bar = 10 mm.

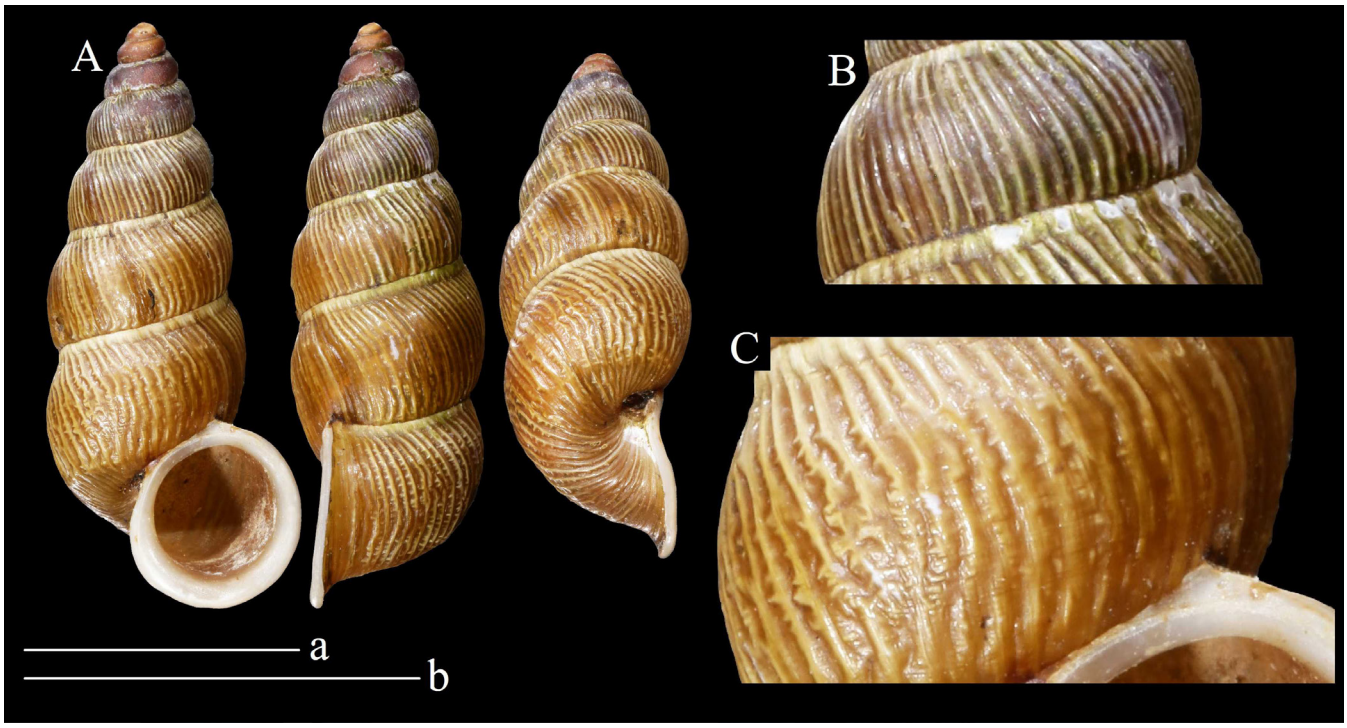


Fig 2. A, *Schistoloma maydelineae* new species, holotype HNHM 103476; B, Sculpture and suture of upper whorls; C, Sculpture of the last whorl. Photographs by: B. Páll-Gergely. Scale "a" = 10 mm and refers to fig. A, scale "b" = 5 mm and refers to figs. B and C.

**Description.** Shell shape high conical, widest at its base, yellowish brown; some shells (e.g., holotype) with dark red-purple protoconch and upper whorls, others with brownish-yellowish apical whorls; protoconch consists of 3 whorls, opaque, without any notable sculpture; teleoconch with strong but low ribs that are paler than rest of shell; ribbing becoming less regular towards aperture, because ribs have perpendicular projections, which do not extend neighbouring ribs, and some ribs are not complete (they do not reach both sutures); the most irregularly sculptured area is on the body whorl, where the sculpture looks "hammered"; below suture a "pseudosuture" is visible (slight groove just below the suture), which ends in a conspicuous pale coloured sutural area; aperture circular, straight, or slightly reverse oblique to the shell axis (i.e., in lateral view, basal part of the peristome situated more anteriorly than upper part); peristome continuous, expanded and very slightly reversed, especially in basal part; peristome slender, sharp in lateral view, sometimes looks like double (i.e., formed by the inner and outer peristomes); umbilicus open, slit-like, with a very slight indication of a periumbilical keel, which is formed by the angled ribs. Operculum unknown.

**Measurements.** H: 19.7–21.6 mm, D: 8.4–9.2 mm (n = 6).

**Differential diagnosis.** This species can be distinguished from any congeners by its ribbed shell and white suture. Furthermore, *Schistoloma maydelineae* new species differs from *S. messageri* by the absence of umbilical keel, the more slender, conical shell, and the strongly reticulated sculpture. *Schistoloma inermis* and *Schistoloma croesus* also possess a smooth shell that is smaller than *S. maydelineae* new species.

**Type locality.** Vietnam, Khánh Hoà Province, Khánh sơn, 11°58.7′N, 109°3.6′E.

**Etymology.** This new species is named after the daughter of the last author, Maydeline Faith Chen.

**Distribution.** This new species is thus far known only from the type locality.

### *Schistoloma messageri* (Bavay & Dautzenberg, 1909)
(Fig. 1B)

*Coptochilus messageri* Bavay & Dautzenberg, 1909: 286, plate 11, figs 10–11 (type locality: "Region de Lao-Kay").

**Types examined.** Tonkin, Lao Kay, Coll. C. Bosch ex coll. H. Rolle, SMF 192263/4 shells (labelled as syntype, Fig. 1B).

**Diagnosis.** A large *Schistoloma* species with smooth, elongate-ovoid shell having a strong periumbilical keel. Differs from *Schistoloma cochinchinense* by the smaller, more slender shell, and more prominent keel.

**Distribution.** *Schistoloma cochinchinense* is known from Northern Vietnam (Lao Kay Province).

### *Schistoloma sectilabrum* (A. Gould, 1844)

*Cyclostoma sectilabrum* Gould, 1844: 459, plate 24, fig. 10 (type locality: "Tavoy" [from the title]).
*Schistoloma sectilabrum* — Kobelt, 1902: 280.
*Schistoloma sectilabrum* — Thach, 2016: 38, figs. 119–120.
*Schistoloma sectilabrum* — Egorov, 2013: 14, fig. 22d–f.

**Distribution.** See Remarks.

**Remarks.** Thach (2016) mentioned this species from southern Vietnam (Ninh Hoa District, Khanh Hoa Province), far from all other known localities in the Malay Peninsula, Myanmar (Tavoy and Tenasserim) and Thailand (Tumpeesuwan & Panha, 2008). This species seems to have the largest range in the entire genus.

Two samples (SMF 262529 = "holotype" and SMF 262530 = "paratypes") found in the SMF were labelled as "*Schistoloma siamensis* Brandt" with the following locality data: "Thailand: an den Tanto-Fällen bei Ban Nong Star; Yala Provinz, leg. Brandt, 18-7-1964, No. 1968/1". However, the name "*Schistoloma siamensis*" was never published, and is not available.

### List of *Schistoloma* species not found in Vietnam

Bartsch described numerous subspecies of *Schistoloma* from the Philippines, differing from one another only by shell colouration and shell size. Bartsch is widely known to be as an extreme splitter (see review in Watters, 2006), and in the present case his subspecies do not seem to be worth maintaining. In the list below we recognise only species-level taxa.

#### *Schistoloma altum* (Sowerby I, 1842)

*Cyclostoma altum* Sowerby I, 1842: 84.
*Schistoloma altum*, — Kobelt, 1902: 278.
*Schistoloma* (*Schistoloma*) *alta alta*, — Bartsch, 1916: 197, plate 51, figs. 9, 11.
*Schistoloma* (*Schistoloma*) *alta mindoroensis* Bartsch, 1916: 198, plate 51, figs. 1, 3. **new synonym**
*Schistoloma* (*Schistoloma*) *alta rombloensis* Bartsch, 1916: 199. **new synonym**
*Schistoloma* (*Schistoloma*) *alta sibuyanensis* Bartsch, 1916: 199. **new synonym**
*Schistoloma* (*Schistoloma*) *alta pygmaea* Bartsch, 1916: 200. **new synonym**
*Schistoloma altum* — Egorov, 2013: 14, fig. 22a.

**Type locality.** "supra truncos arborum in montibus insulæ Negros, Philippinarum".

**Remarks.** We have not examined the type specimens, but based on the descriptions it became obvious that the differences are so slight (only differing in colour of peristome), that the subspecies of Bartsch (1916) cannot be maintained.

#### *Schistoloma anostoma* (Benson, 1852)

*Cyclostoma Anostoma* Benson, 1852: 269.
*Schistoloma anostoma* — Kobelt, 1902: 278.

**Type locality.** "Insula Borneo".

#### *Schistoloma doriae* (Issel, 1874)

*Megalostoma Doriae* Issel, 1874: 430, plate 6, figs. 18–19.
*Schistoloma doriae* — Kobelt, 1902: 279.

**Type locality.** "Territorio di Sarawak".

#### *Schistoloma funiculalum* (Benson, 1838)

*Cyclostoma Funiculalum* Benson, 1838: 217.
*Schistoloma funiculatum* — Kobelt, 1902: 279.

**Type locality.** "Darjiling Sanatarium".

**Remarks.** About the specific epithet ("*funiculalum*" vs. "*funiculatum*") see Budha et al. (2015).

#### *Schistoloma leferi* (Morelet, 1861)

*Cyclostoma leferi* Morelet, 1861: 176.
*Schistoloma leferi* — Kobelt, 1902: 279.

**Type locality.** Not specified.

#### *Schistoloma longyanensis* Zhou, Zhang & Chen, 2009

*Schistoloma longyanensis* Zhou, Zhang & Chen, 2009: 122, figs 1–8.

**Type locality.** "Forest Park, Longyan City (25°01′N, 117°00′E), Fujian Province, China".

#### *Schistoloma mcgregori* Bartsch, 1916

*Schistoloma* (*Schistoloma*) *mcgregori mcgregori* Bartsch, 1916: 200, plate 51, figs. 2, 4.
*Schistoloma* (*Schistoloma*) *mcgregori tablasensis* Bartsch, 1916: 201. **new synonym**
*Schistoloma* (*Schistoloma*) *mcgregori webbi* Bartsch, 1916: 202. **new synonym**

**Type locality.** "Semarara Island" (for the nominotypical subspecies).

**Remarks.** We have not examined the type specimens, but based on the descriptions it became obvious that the differences are so slight (only differing in colour of peristome), that the subspecies of Bartsch (1916) cannot be maintained.

#### *Schistoloma pauperculum* (Sowerby I, 1850)

*Cyclostoma pauperculum* Sowerby I, 1850: 166, plate 31, figs. 318.
*Schistoloma pauperculum* — Kobelt, 1902: 280. (mentioned as Sowerby, 1843)

**Type locality.** "Bootan".

#### *Schistoloma quadrasi* (Hidalgo, 1889)

*Megalostoma Quadrasi* Hidalgo, 1889: 305, plate 15, fig. 5.
*Schistoloma quadrasi* — Kobelt, 1902: 280.
*Schistoloma* (*Hololoma*) *quadrasi quadrasi* Bartsch, 1916: 203, plate 51, figs. 8, 10.
*Schistoloma* (*Hololoma*) *quadrasi coronensis* Bartsch, 1916: 204. **new synonym**
*Schistoloma quadrasi coronensis* — Egorov, 2013: 14, fig. 22B.
*Schistoloma quadrasi quadrasi* — Egorov, 2013: 14, fig. 22B1.

**Type locality.** "Peñon de Bintuan, dans l'île de Busuanga".

***Schistoloma sumatranum* (Dohrn, 1881)**

*Coptocheilus Sumatranus* Dohrn, 1881: 65.
*Schistoloma sumatranum* — Kobelt, 1902: 281.

**Type locality.** "in insula Sumatra, Singalang".

***Schistoloma tanychilus* (Godwin-Austen, 1876)**

*Megalostoma tanycheilus* Godwin-Austen, 1876: 180.
*Schistoloma tanychilus* — Kobelt, 1902: 281.

**Type locality.** "Dikrang valley, low down, ranging up to about 2,500 feet".

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